



18 Constitution Drive, Suite 8
Bedford, NH 03110
Tele: (603) 637-1043
Fax: (866) 783-7101

Scott M. Bourcier, P.E.
Project Manager

ENGINEERING • PLANNING • MANAGEMENT • DEVELOPMENT

MEMORANDUM

TO: Conner MacIver, Town Administrator

RE: Pond Hill Road – Existing Culvert and Road Evaluation
Barrington, NH

DATE: June 10, 2019

Per the Town of Barrington's (Town) request, DuBois & King made a site visit to Pond Hill Road within the vicinity of Daniel Carter Road on April 17, 2019. The purpose of the site visit was to perform a preliminary visual evaluation of the existing cross culvert located along Pond Hill Road crossing over the discharge of Little Long Pond to Ayers Pond. Below are our findings.

1. Pond Hill Road connects Route 202A and 202.
2. The evaluation area was limited to Pond Hill Road between 300 feet north of the Pond Hill Road / Daniel Carter Road Intersection and 650 feet north of the Pond Hill Road / Covenant Way intersection.
3. The Pond Hill Road is a bituminous concrete (aka pavement) roadway that consists of (2) 11-foot travel lanes flanked by approximately 3-foot gravel shoulders and a posted speed limit of 30 miles per hour (mph).
4. Pond Hill Road pavement surface within the evaluation area is in fair condition with some evidence of alligator cracking, pavement shoving, and slight rutting.
5. Pond Hill Road evaluation area consists of two (2) culvert crossings; wetland area discharge and Little Long Pond discharge.
6. The wetland area discharge is located approximately 450 feet south of the Pond Hill Road / Daniel Carter Road intersection.
 - a. The wetland area is estimated to be approximately 1.3 acres in area, consists of a watershed area of approximately 15 acres, and contributes runoff to Little Long Pond.
 - b. The wetland discharge culvert a 15-inch corrugate metal pipe (CMP) with no headwall or flared-end section (FES), and shows evidence of deterioration.
 - c. According to Barrington Highway Department staff, the culvert fills with sedimentation and requires a high frequency of cleaning.
7. The Little Long Pond discharge is located along the southerly side of the Pond Hill Road / Daniel Carter Road intersection.
 - a. Little Long Pond is estimated to be approximately 19.1 acres in area, consists of a watershed area of approximately 518 acres, and contributes runoff to Ayers Pond.
 - b. Unable to assess the condition of the culvert as it was submerged at the time of the site visit.
 - c. According to Barrington Highway Department staff,
 - i. The existing 30-inch discharge culvert from Little Long Pond consists of two pipe materials; high-density polyethylene (HDPE) pipe and reinforced concrete pipe (RCP).
 - ii. The HDPE pipe material spans from the culvert's inlet to the centerline of Pond Hill Road, while the RCP extends from the roadway centerline to the culvert's outlet.
 - iii. The two pipes are separating and settling at the joint causing the culvert to concave between the inlet / outlets.
 - iv. Beavers carry debris into the cross-culvert and block discharge flow.

- d. Discharge from Little Long Pond flows along a drainage swale that parallels Daniel Carter Road to twin 48-inch reinforced concrete pipe (RCP) culverts and ultimately conveys surface water to Ayers Pond. Condition of the Daniel Carter Road twin culverts were unable to assess due to the high flow conditions at the time of the site visit.

DuBois & King performed a preliminary hydrologic and hydraulic (H&H) evaluation of the wetland discharge, Little Long Pond discharge, and Daniel Carter Road culvert crossings using a combination of rational method and a web-based Geographic Information Systems (GIS) application software called *StreamStats*, as developed by the United States Geological Survey (USGS). Both methodologies delineate stormwater runoff watershed boundaries and then statistically calculate stream flows for specific storm events. For the three crossings, stream flows associated with the 50 and 100-year storm events were selected to conform with current New Hampshire industry standards. Industry standards are based on the New Hampshire Department of Transportation's (NHDOT) standard bridge design of passing the 50-year, plus 1-foot of freeboard, and the New Hampshire Department of Environmental Services (NHDES) Stream Crossing Rules (Env-Wt 900) of passing the 100-year storm event. Based on the preliminary hydrologic calculations, the respective 50 and 100-year storm event flows are 28cfs / 30cfs for the wetland discharge, 157cfs / 194cfs for the Little Long Pond discharge and 177cfs / 216cfs for the Daniel Carter Road culvert crossings.

The Based on the 50 and 100-year storm event flows, DuBois & King completed a preliminary hydraulic evaluation of the three (3) culvert crossings. HY-8 Culvert Hydraulic Analysis software program, as developed by the Federal Highway Administration (FHWA), was used compute flow capacity of the three (3) culvert crossings. The results demonstrated that all three (3) culvert crossings were in flood conditions (water overtopped the roadway) during a 50-year storm event.

Below are existing condition photographs of our site visit.



Pond Hill Road pavement surface condition 01



Pond Hill Road pavement surface condition 02



Sink hole at Little Long Pond culvert inlet



Little Long Pond culvert outlet



Daniel Carter Road swale to Ayers Pond



Daniel Carter Road twin cross-culverts
to Ayers Pond

Recommendation:

Based on the deterioration of the culvert materials, the potential flood conditions, and beaver activity impacts, DuBois & King recommends replacing both the wetland and Little Long Pond discharge culverts under Pond Hill Road located within the evaluation area. The preliminary hydrologic and hydraulic (H&H) evaluation, suggests replacing the existing 15-inch wetland discharge and 30-inch Little Long Pond discharge culverts with a 36-inch culvert and a 10-foot span by 4-foot high pre-cast concrete bridge structure; respectively.

DuBois & King also recommends replacing the Daniel Carter Road twin culvert crossing. Due to the crossing conveying flow from Little Long Pond and surrounding watershed runoff, the preliminary hydrologic and hydraulic (H&H) evaluation, suggests replacing the existing twin 36-inch culverts with a 10-foot span by 4-foot high pre-cast concrete bridge structure.

As part of the replacement design, DuBois & King recommends a detailed H&H evaluation be completed on all three (3) cross-culverts to appropriately size each crossing. The Town will be required to file a New Hampshire Department of Environmental Services (NHDES) – Wetland Standard Dredge & Fill permit for each replaced culvert crossing.

Last, DuBois & King recommends raising the roadway profile of Pond Hill Road and Daniel Carter Road within the evaluation area. Raising the roadway profiles will mitigate potential flooding conditions and provide the required cover over the respective bridge structures along Pond Hill Road and Daniel Carter Road. Please see Figure 1 – Project summary overview that graphically illustrates the recommended improvements.

For budgetary purposes, DuBois & King has prepared a preliminary engineer's opinion of project cost. The engineer's opinion of project costs includes the anticipated construction costs (based on NHDOT pay items and current average weighted unit priced obtained by NHDOT data), a 25% construction cost contingency, an engineer design/permitting/bidding design cost, and an engineer construction observation costs. DuBois & King has estimated the total project cost to be approximately \$1,322,000; please see attached. While the project is currently proposed as a single construction project, we anticipate that during design a project phasing plan could be developed.

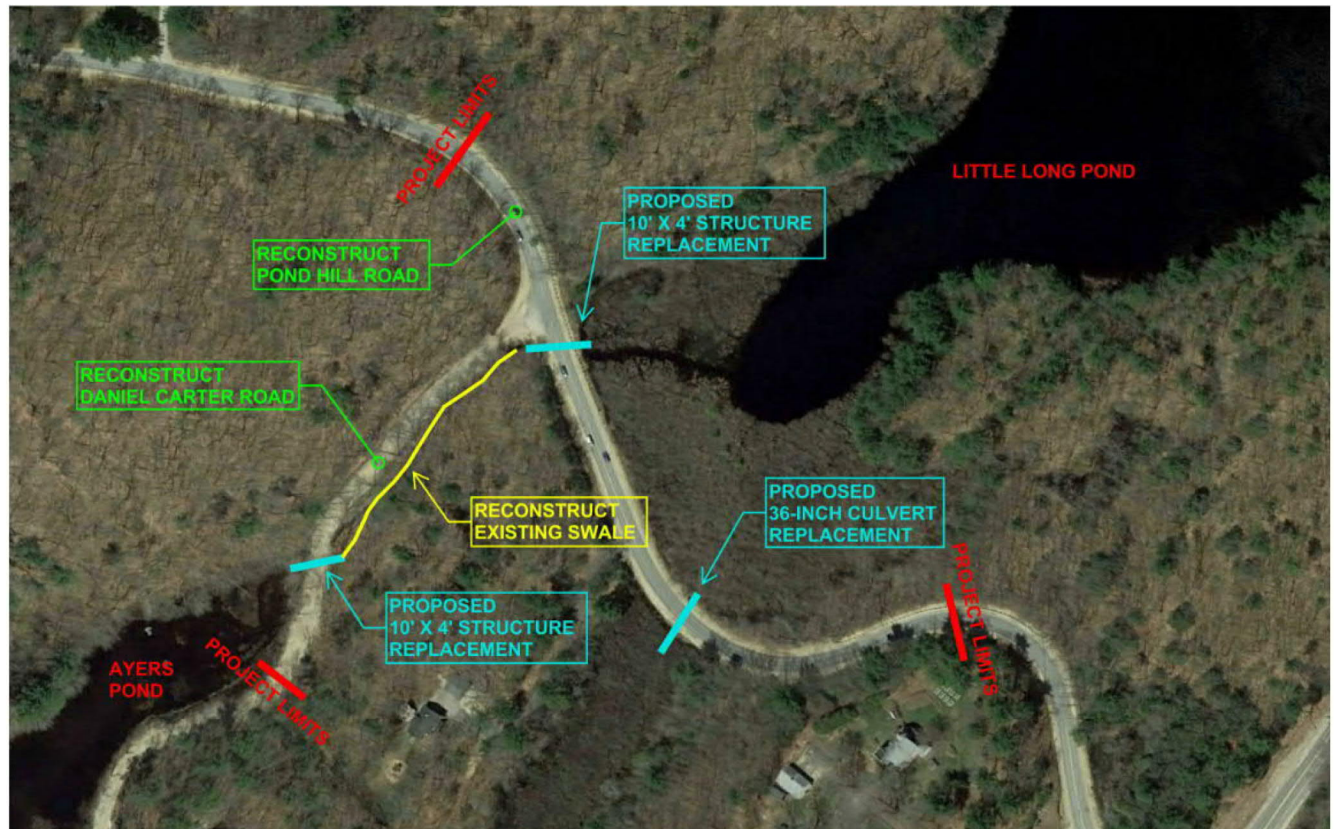


Figure 1 – Project summary overview

End of Memorandum



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Project: Pond Hill Road - Barrington, NH

Calculated By: BJV

Date: 05/23/19

Checked By: SMB

Date: 05/25/19

NOTE: In providing opinions of probable construction costs, the Client understands that DuBois & King, Inc. has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's methods of pricing, and that our Opinion of Probable Construction Costs are made on the basis of our professional judgment and experience. DuBois & King, Inc. makes no warranty, expressed or implied, that the bids or the negotiated costs of the Work will not vary from the Opinion of Probable Construction Cost provided herein.

OPINION OF PROBABLE PROJECT COST

UNIT NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
202.41	Removal of Existing Pipe 0"-24" Diameter	LF	120	\$20.00	\$ 2,400.00
202.42	Removal of Existing Pipe Over 24" Diameter	LF	50	\$22.00	\$ 1,100.00
202.7	Removal of Guardrail	LF	250	\$5.00	\$ 1,250.00
203.1	Common Excavation	CY	550	\$14.00	\$ 7,701.00
203.6	Embankment-in-Place	CY	3750	\$8.00	\$ 30,000.00
207.3	Unclassified Channel Excavation	CY	150	\$24.00	\$ 3,600.00
214	Fine Grading	U	1	\$10,000.00	\$ 10,000.00
304.2	Gravel	CY	1700	\$25.00	\$ 42,502.00
304.3	Crushed Gravel	CY	950	\$32.00	\$ 30,401.00
403.11001	Hot Bituminous Pavement, Machine Method (Tier 1)	TON	475	\$80.00	\$ 37,998.00
403.11002	Hot Bituminous Pavement, Machine Method (Tier 2)	TON	280	\$80.00	\$ 22,402.00
503.1	Water Diversion Structure	U	2	\$20,000.00	\$ 40,000.00
504.1	Common Bridge Excavation	CY	700	\$26.00	\$ 18,200.00
508	Structural Fill	CY	90	\$42.00	\$ 3,781.00
583.1	Riprap, Class I	CY	125	\$45.00	\$ 5,626.00
---	36" HDPE Culvert	LF	50	\$100.00	\$ 5,000.00
---	36" PE Flared-end Section	EA	2	\$400.00	\$ 800.00
606.0001	Steel Beam for Beam Guardrail	LF	250	\$12.00	\$ 3,000.00
606.012	W6x9 Steel Post Replacements for Beam Guardrail Posts	EA	40	\$60.00	\$ 2,399.00
606.0122	W6x9 Steel Post Assemblies for Beam Guardrail Posts	EA	40	\$12.00	\$ 480.00
619.1	Maintenance of Traffic	U	1	\$30,000.00	\$ 30,000.00
619.253	Portable Changeable Message Sign	U	2	\$2,000.00	\$ 4,000.00
632.0104	Retroreflective Paint Pave. Marking, 4" Line	LF	4800	\$0.25	\$ 1,200.00
641	Loam	CY	475	\$30.00	\$ 14,251.00
645.2535	Coir Fiber Matting for Erosion Control	SY	1350	\$6.00	\$ 8,100.00
645.119	Mulch with Tackifiers	SY	0.9	\$1,300.00	\$ 1,171.00
645.531	Silt Fence	LF	2200	\$3.00	\$ 6,600.00
645.7	Storm Water Pollution Prevention Program	U	1	\$5,000.00	\$ 5,000.00
645.71	Monitoring SWPPP and Erosion and Sediment Controls	HR	140	\$90.00	\$ 12,600.00
692	Mobilization	U	1	\$50,000.00	\$ 50,000.00
900	Precast Concrete Box Culvert (4' x 10') w/ Wingwalls	EA	2	\$250,000.00	\$ 500,000.00

Construction Sub-Total \$ 901,562.00

25% Contingency \$ 225,390.50

Construction Total \$1,126,952.50

Engineering Design / Permitting / Bidding \$ 120,000.00

Engineering Construction Observation \$ 75,000.00

Project Total \$1,321,952.50

PROJECT COST ESTIMATE \$ 1,322,000